October 2005
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LMX9830DONGLE Hardware User Guide

1.0 Scope

National Semiconductor LMX9830 Bluetooth™ serial dongle reference design kit is a plug and play serial adapter for serial cable replacement applications and more. It is able to support more profiles than just the Serial Port Profile (including audio support with external codec boards). By using the enclosed Simply Blue Commander software, it allows user to develop their own SW applications easily given the built in interpreter for HEX commands. SBsmart is a higher level application tool that provides buttons with the built in commands to easily set up or demonstrate different profile support using the SimplyBlue SPP package.

2.0 General Description

2.1 REFERENCE DESIGN KIT CONTENTS

- LMX9830 Bluetooth serial adapter reference board
- USB Dongle and application software stack
- Null modem cable
- Sedona Lite board (CODEC)
- 110V to 240V AC to 5V DC power adapter and pigtail
- CDROM with design documents and SimplyBlue software Application tools.

2.2 LMX9830 BLUETOOTH SERIAL ADAPTER REFERENCE BOARD WITH CHIP ANTENNA ON BOARD

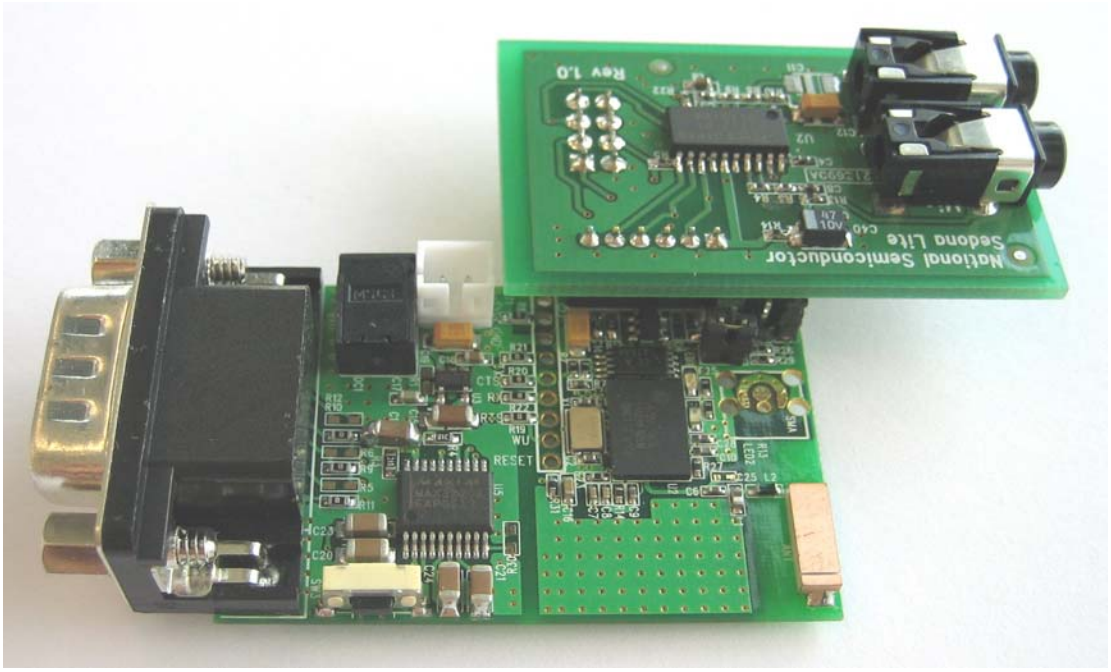

Figure 1. Reference Board and Sedona Lite Board

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3.0 Requirement and Setup

3.1 BASIC REQUIREMENT

- X86 PC with serial port.
- One of the following operating system is required.
  - — Windows 2000
  - — Windows XP

3.2 APPLICATION SOFTWARE

3.2.1 SimplyBlue Commander

Application command oriented tool to generate commands and watch events in the Simply Blue Command interface window. Reference the Simply Blue Commander User Guide document for details.

3.2.2 SBSmart

Easy to use Windows based tool to demonstrate additional profile support of the SimplyBlue functionality. Reference the SBSmart User Guide for additional details.

3.2.3 Patch Programming

LMX9830 allows for patch programming for firmware update if necessary. Reference the LMX9830 SW User Guide document for details. Can also be done with the SimplyBlue Commander tool.

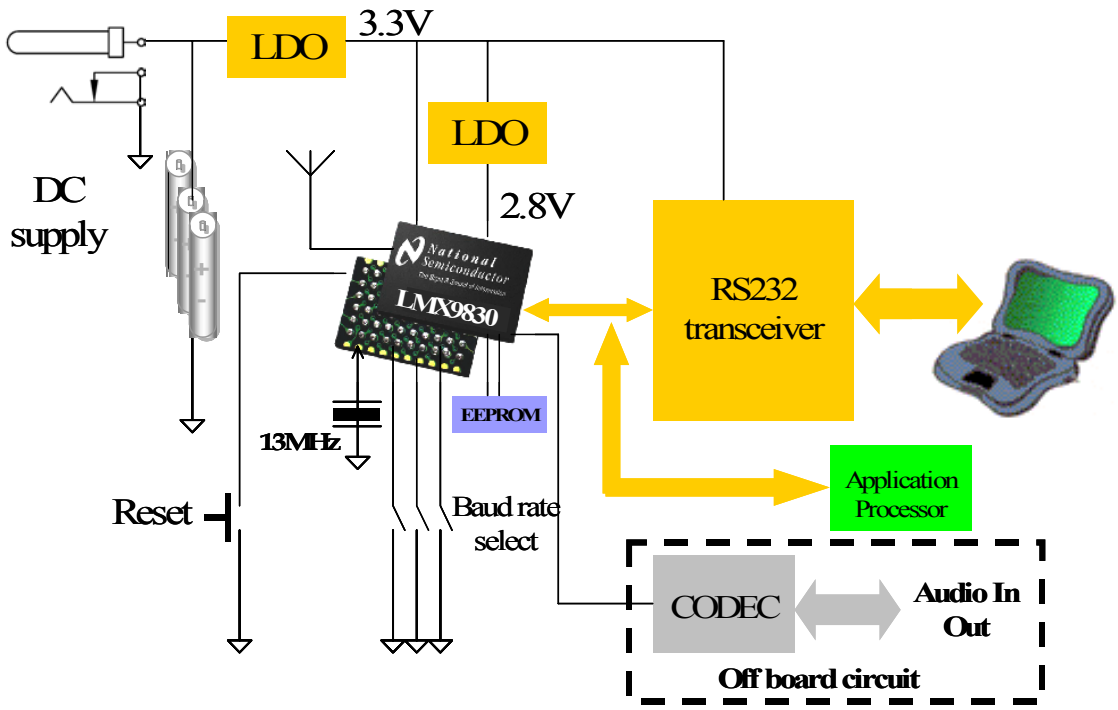

Figure 2. System Block Diagram

4.0 Functional Description

4.1 POWER SUPPLY

- DC Power Jack (6V max)
- Battery Holder (6V max)

4.2 MAIN SYSTEM

- Crystal - 13MHz
- Reset button for manual Reset
- Jumper option for Baud rate selection

4.3 UART INTERFACE

DB9 connector for RS232 standard PC interface using On-board level shifter IC for handling LMX9830 module's 3.3V UART interface.

4.4 ADVANCE AUDIO INTERFACE

- Support Audio applications
- PCM codec interface (support linear and A-law)
- PCM Master or Slave operation (SW configurable)
- Direct connection to Sedona Lite Board (A-law only)

4.5 ANTENNA

- The Chip Antenna on board matched with RFinout of LMX9830 (50 ohm typ)
- Optional SMA connector for external antenna or direct cable for conducted measurements

5.0 Design Consideration

5.1 CARRIER FREQUENCY OFFSET

- Is highly dependant on the stability of main crystal (13MHz).
- Is recommended to be less than +/-20ppm over the entire operating temperature.

5.2 POWER MANAGEMENT

- 3.3V output single LDO is used to provide power for RS232 interface chip and Digital portion of the LMX9830.
- 2.8V output single LDO is used to provide power for RF circuitry of the LMX9830.

5.3 ANTENNA DESIGN

- Chip Antenna is selected due to good price performance rating.
- Matching circuit is necessary and RFinout of LMX9830 is 50 ohm typical.
- Bandwidth of Antenna should be more than 100MHz (2.45GHz center frequency and VSWR<2).

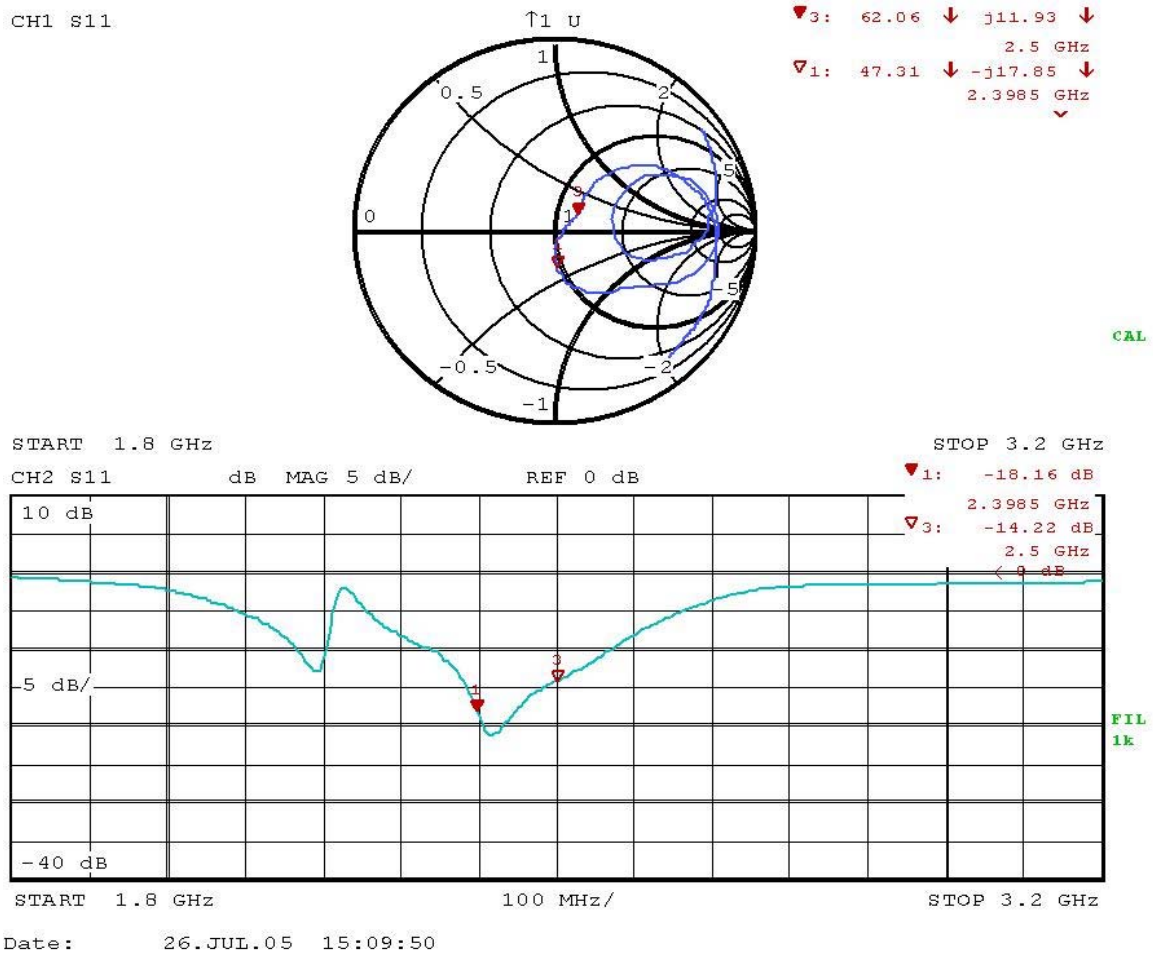

Figure 3. S11 measurement on ANT pin

6.0 Layout Consideration

The LMX9830 reference design is split into 2 sections, one section is RS232 transceiver circuit for PC connection, another section is LMX9830 main circuit for Host processor. (Figure 4)

6.1 PCB REQUIREMENT

- 4 layers PCB required
- 1 mm overall thickness

6.2 LAYERS CLASSIFICATION

- Top layer is the components and main signals layer
- 2nd layer is ground plane
- 3rd layer is power plane
- Bottom layer is interface signals and ground plane
- RF circuit requirement
- Large ground plane with ground via's is must for good RF performance
- 50 ohm transmission line is used for matching between RFinout and Antenna
- T-network is designed for different type of Antenna matching
- Keep the maximum distance between main crystal and Antenna to avoid coupling of TDD signals from Antenna

7.0 Board components and Pin Assignments

A summary of the configuration and selection jumpers is provided in the tables that follow. Reference both the schematic and PCB layout (included on the CD in the kit)

Table 1 Major Components List

Device	Description
U1	64K EEPROM (access.bus)
U2	National LMX9830 Serial Port Module - Reference the device datasheet.
U3	National LP3985 Low-Dropout Voltage Regulator
U4	National LP3985 Low-Dropout Voltage Regulator
U5	Maxim MAX3225 1 Mbps High Speed UART Driver
X1	13 MHz Crystal - Reference the crystal device datasheet and the LMX9830 datasheet for details.

Table 2 Connectors Summary

Connector	Description	Details
BAT1	Battery Connector 2mm pitch	Maximum input voltage is 6V
DC1	DC jack	Same as above
J1	DP9 serial connector (male)	See Table 7
J2	External processor interface	See Table 6
J3	Advance Audio interface	See Table 7

Table 3 Jumper and Test Point Summary

Jumper/Test Point	Description	Details
SMA	RF connector	Optional
P1	BBCLK	Test point for system clock
R15,16 and 18	Clock & UART setting jumper	See Table 8

Table 4 Switch and LEDs

Switch/LED	Description
SW3	Reset button
LED2	Operation Status
LED1	Data Traffic (TX/RX)

Table 5 J1 DP9 (male) Pin Assignments

Pin #	Signal name	Description
1	NC	No connection
2	RxD	Receive Data (input)
3	TxD	NCTransmit Data (output)
4	NC	No connection
5	GND	Ground
6	NC	No connection
7	RTS	Ready to send (output)
8	CTS	Clear to send (input)
9	NC	No connection

(Continued)

Table 6 J2 External Processor Interface

Pin #	Signal name	Description
1	LDO_CTL	ON/OFF control of LDO (input)
2	3V6	Power Supply, maximum 3.6V (input)
3	GND	Ground
4	UART_TX	Transmit Data (output)
5	UART_CTS	Clear to send (input)
6	UART_RX	Receive Data (input)
7	UART_RTS	Ready to send (output)
8	HOST_WU	Not used on LMX9830 - only used for LMX9820A
9	RESET	Reset (input)

Table 7 J3 Advance Audio Interface

Pin #	Signal name	Description
1	3VB	LDO output (2.8V)
2	AAI_SCLK	Advanced Audio Interface Clock
3	AAI_STD	Advanced Audio Interface Transmit Data
4	AAI_SFS	Advanced Audio Interface Frame Synchronization
5	AAI_SRD	Advanced Audio Interface Receive Data
6	GND	Ground

Table 8 UART interface setting (13MHz)

R15	R16	R18	UART baud rate
Short	Short	Short	921600bps (default)
Short	Open	Short	115200bps
Open	Short	Short	9600bps

Table 8 UART interface setting (13MHz)

Open	Open	Short	NVS (9600bps)

Table 9 J1 (Sedona Lite Board)

Pin #	Signal name	Description
1	Vcc	3.3V Input
2	SCLK	PCM Clock
3	STD	PCM Input Data
4	SFS	PCM Frame Synchronization
5	SRD	PCM Output Data
6	GND	Ground

Table 10 J2 (Sedona Lite Board)

Pin #	Signal name	Description
1	SCLK	PCM Clock
2	GND	Ground
3	SFS	PCM Frame Synchronization
4	Vcc	3.3V Input
5	STD	PCM Input Data
6	NC	No Connection
7	SRD	PCM Output Data
8	GND	Ground

Table 11 Audio Connection

P17	For PC Microphone
P15	For PC Headphone

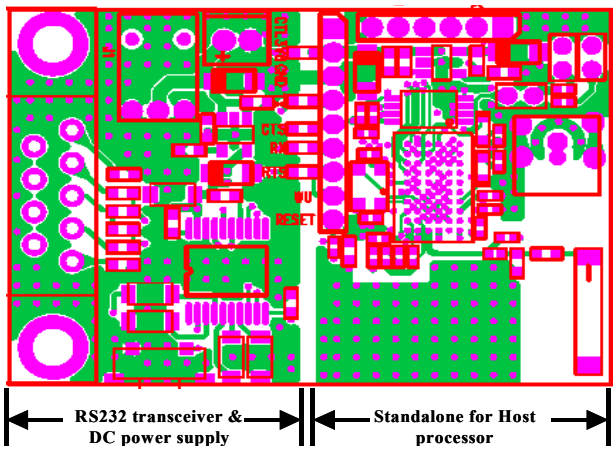

Figure 4. Top view of Reference board

8.0 Bill of materials (Reference Board)

Item Name	Description	Vendor	Part Number
X1	TEW, TAS-4025A,13.000MHz	TEW	20-A0058
X2	32.768kHz crystal	RALTRON	R26-32.768-12.5
ANT1	Chip Antenna	MuRata	ANCW12G45SAA117TT1
C1,C2	Capacitor 12p 0402 COG 50V	MuRata	GRM36COG120D50
C34,C35	Capacitor 22p 0402 COG 50V	MuRata	GRM36COG220J50
C3	Capacitor 100n 0402 Y5V16V	MuRata	GRM36Y5V104Z16
C4	Capacitor 2u2F0603 Y5V 10V	MuRata	GRM39Y5V225Z10
C5,C29,C33	Capacitor 10n 0402 X7R 50V	MuRata	GRM36X7R103K50
C27,C28	Capacitor 4p7 0402 COG 50V	MuRata	GRM36COG4R7J50
C6	Capacitor 8p2 0402 COG 50V	MuRata	GRM36COG8R2J50
C7	Capacitor 2200p 0402 X7R 50V	MuRata	GRM36X7R222K50
C8	Capacitor 220p 0402 COG 50V	MuRata	GRM36COG221J50
C9	Capacitor 39p 0402 COG 50V	MuRata	GRM36COG390J50
C10	Capacitor 1n 0402 X7R 16V	MuRata	GRM36X7R102K16
C26,C30,C31, C32	Capacitor 100n 0402 X7R 16V	MuRata	GRM36X7R104K16
C13,C14,C17	Capacitor 10n 0603 X7R 50V	MuRata	GRM39X7R102K50
C18	Capacitor 100n 0603 X7R 16V	MuRata	GRM39X7R104K50
C16	Capacitor 100p 0603 COG 50V	MuRata	GRM39COG101J50
C19,C22	TANT CAP 1uF 6.3V SIZE A	Any	
C12,C15	TANT CAP 2.2uF 6.3V SIZE A	Any	
C11,C20,C21, C23,C24	Capacitor 1uF 1206 X7R 25V	MuRata	GRM42-6X7R105K25
L1	Chip Inductor 2N2 0603	MuRata	LQG18HN2N2S00
L2	Chip Inductor 3N9 0603	MuRata	LQG18HN3N9S00
BAT1	Battery holder (2mm pitch)	Any	
SW3	TACK SWITCH TS-1135HS	RAINBOW	
DC1	DC POWER JACK	Morning string limited	DC-015
LED2	Red Color LED 0603 Size	Any	
LED1	Blue Color LED 0603 Size	Any	
J1	DB9 (male) serial connector	Any	
J3	2mm Header (6 poles)	Any	
U1	64K EEPROM	ATMEL	AT24C64A-10TI-1.8
U2	Bluetooth SPP Micro Module	National Semiconductor	LMX9830SM
U3	Low Dropout Regulator	National Semiconductor	LP3985IM5-3.3
U4	Low Dropout Regulator	National Semiconductor	LP3985IM5-2.8
U5	High Speed RS232 Transceivers	Maxim	MAX3225EEAP
R17	Resistor 0603 Size, 1K	Any	
R3,R4	Resistor 0603 Size, 10K	Any	
R8,R9,R10,R 11,R19,R20,R 21,R22	Resistor 0603 Size, 0R	Any	
R2,R7,R28,R 29	Resistor 0402 Size, 1K	Any	
R13,R25	Resistor 0402 Size, 330R	Any	

(Continued)

Item Name	Description	Vendor	Part Number
R14,R17	Resistor 0402 Size, 10K	Any	
R23	Resistor 0402 Size, 3K3	Any	
R26,C35	Resistor 0402 Size, 0R	Any	
R31	Resistor 0402 Size, 100K	Any	
R16	2mm header	Any	
R15, R18	2mm header (with jumper)	Any	

9.0 Bill of Materials (Sedona Lite Board)

Item Name	Description	Vendor	Part Number
C3,C4,C5,C6	Capacitor 100nF	Any	Ceramic cap
C6	Capacitor 1uF	Any	Ceramic cap
C12	TANT CAP 10uF, 10V	Any	
C40	TANT CAP 47uF, 6.3V	Any	
C11	Not mount		
J1	2mm socket (6 poles)	Any	
J2	2.54mm socket (2 x 4 poles)	Any	
P15	Socket for speaker (mono)	Morning Star	MSJ-1537
P17	Socket for microphone (mono)	Morning Star	MSJ-1537
R10	Resistor 0402 Size, 10R	Any	
R13,R14	Resistor 0402 Size, 1K	Any	
R5,R22	Resistor 0402 Size, 4.7K	Any	
R3	Resistor 0402 Size, 10K	Any	
R4,R8,R9	Resistor 0402 Size, 47K	Any	
U2	Single Rail Codec	OKI	MSM7717-01MS-K

10.0 References

- LMX9830 Bluetooth Serial Port Module data sheet
- LMX9830 Bluetooth Serial Port Module - Software Users Guide
- SBSmart user guide

Figure 5. Sedona Board

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